

CLAIMS

What is claimed is:

1. A network device for a destination end of a double-ended soft permanent virtual circuit (SPVC) connection, the SPVC connection coupling from a source end to the destination end via a communications network, said network device comprising:
 - a database memory adapted to store an access identifier of at least one predetermined source network device from which the network device is allowed to accept an SPVC connection;
 - a connection manager adapted to allocate a permanent virtual circuit (PVC) connection and a switched virtual circuit (SVC) connection on said network device; and
 - an SPVC manager coupled with said database memory and said connection manager, said SPVC manager being adapted to control said connection manager and receive an SPVC connection message comprising an access identifier of a source network device, said SPVC manager being further adapted to determine if the access identifier of the source network device matches the access identifier in said database memory.
2. The network device in accordance with claim 1, wherein said SPVC manager is further adapted to:
 - accept an SPVC connection if the access identifier of the source network device matches the access identifier in said database memory;
 - cross-connect an incoming SVC connection leg with a PVC connection leg; and
 - associate the PVC connection leg with the access identifier.

3. The network device in accordance with claim 2, wherein said SPVC manager is further adapted to determine if the access identifier of the source network device matches the access identifier in said database memory after finding a matching PVC connection leg in accordance with the SPVC connection message.

4. The network device in accordance with claim 3, wherein said SPVC manager is further adapted to reject the SPVC connection if the access identifier of the source network device does not match the access identifier in said database memory.

5. The network device in accordance with claim 1, wherein the access identifier comprises:

a network service access point (NSAP) address of the source network device.

6. The network device in accordance with claim 1, wherein the access identifier comprises:

an alias for a closed user group (CUG).

7. The network device in accordance with claim 1, wherein the communications network comprises:

an Asynchronous Transfer Mode (ATM) network.

8. The network device in accordance with claim 1, wherein the communications network comprises:

a Frame Relay (FR) network.

9. The network device in accordance with claim 1, wherein the source end comprises:

an edge router.

10. The network device in accordance with claim 1, wherein the source end comprises:

a digital subscriber line (DSL) access concentrator.

11. The network device in accordance with claim 1, wherein the destination end comprises:

a destination network switch.

12. The network device in accordance with claim 1, wherein the destination end comprises:

a destination edge router.

13. The network device in accordance with claim 1, wherein the destination end comprises:

a digital subscriber line (DSL) access concentrator.

14. A network device for a source end of a double-ended soft permanent virtual circuit (SPVC) connection, the SPVC connection coupling from the source end to a destination end via a communications network, said network device comprising:

an user interface module adapted to receive commands and a request to create an SPVC connection from the source end to the destination end;

a connection manager adapted to allocate permanent virtual circuit (PVC) connections and switched virtual circuit (SVC) connections on said network device; and

an SPVC manager coupled with said user interface module and said connection manager and adapted to control said connection manager, said SPVC manager being further adapted to generate and transmit an SPVC connection message comprising an access identifier of the network device.

15. The network device in accordance with claim 13, further comprising:

a configuration module coupled to said user interface module, said configuration module being adapted to associate, in response to a command, a destination network device with an access identifier of at least one predetermined source network device from which the destination network device is allowed to accept an SPVC connection.

16. A system for controlling a double-ended soft permanent virtual circuit (SPVC) connection, the SPVC connection coupling from a source end to the destination end via a communications network, said system comprising:

a first network device for the source end, said first network device comprising:

an user interface module adapted to receive commands and a request to create an SPVC connection from the source end to the destination end;

a first connection manager adapted to allocate a permanent virtual circuit (PVC) connection and a switched virtual circuit (SVC) connection on said first network device; and

a first SPVC manager coupled with said user interface module and said first connection manager and adapted to control said first connection manager, said first SPVC manager being further adapted to generate and transmit an SPVC connection message comprising an access identifier of the network device; and

a second network device for the destination end, said second network device comprising:

a database memory adapted to store an access identifier of at least one predetermined source network device from which the second network device is allowed to accept an SPVC connection;

a second connection manager adapted to allocate a PVC connection and a SVC connection on said second network device; and

a second SPVC manager coupled with said database memory and said second connection manager, said second SPVC manager being adapted to control said second connection manager and receive an SPVC connection message comprising an access identifier of a source network device, said second SPVC manager being further adapted to determine if

the access identifier of the source network device matches the access identifier in said database memory.

17. The system in accordance with claim 15, further comprising:

a configuration module coupled adapted to associate, in response to a command, a destination network device with an access identifier of at least one predetermined source network device from which the destination network device is allowed to accept an SPVC connection.

18. The system in accordance with claim 16, wherein said configuration module is coupled to said user interface module.

19. The system in accordance with claim 15, wherein said second SPVC manager is further adapted to:

accept an SPVC connection if the access identifier of the source network device matches the access identifier in said database memory;

cross-connect an incoming SVC connection leg with a PVC connection leg; and
associate the PVC connection leg with the access identifier.

20. The system in accordance with claim 18, wherein said second SPVC manager is further adapted to determine if the access identifier of the source network device matches the access identifier in said database memory after finding a matching PVC connection leg in accordance with the SPVC connection message.

21. The system in accordance with claim 19, wherein said second SPVC manager is further adapted to reject the SPVC connection if the access identifier of the source network device does not match the access identifier in said database memory.
22. The system in accordance with claim 15, wherein the access identifier comprises:
a network service access point (NSAP) address of the source network device.
23. The system in accordance with claim 15, wherein the access identifier comprises:
an alias for a closed user group (CUG).
24. The system in accordance with claim 15, wherein the communications network comprises:
an Asynchronous Transfer Mode (ATM) network.
25. The system in accordance with claim 15, wherein the communications network comprises:
a Frame Relay (FR) network.
26. The system in accordance with claim 15, wherein the source end comprises:
an edge router.

27. The system in accordance with claim 15, wherein the source end comprises:
a digital subscriber line (DSL) access concentrator.
28. The system in accordance with claim 15, wherein the destination end comprises:
a destination network switch.
29. The system in accordance with claim 15, wherein the destination end comprises:
a destination edge router.
30. The system in accordance with claim 15, wherein the destination end comprises:
a digital subscriber line (DSL) access concentrator.
31. A method for controlling a double-ended soft permanent virtual circuit (SPVC) connection from a source end to a destination end via a communications network, said method comprising:
- receiving an SPVC connection message from a first network device for the source end;
 - accepting an SPVC connection in accordance with the SPVC connection message if a second network device receiving the SPVC connection has an association with the first network device; and
 - rejecting the SPVC connection if the second network device does not have an association with the first network device.

32. The method in accordance with claim 30, further comprising:
- associating the second network device with an access identifier of a network device from which the second network device is allowed to accept an SPVC connection.
33. The method in accordance with claim 31, wherein said associating comprises:
- creating an access list comprising at least one access identifier.
34. The method in accordance with claim 31, further comprising:
- determining if an access identifier of the first network device matches the access identifier associated with the second network device in response to receiving the SPVC connection message.
35. The method in accordance with claim 31, wherein the SPVC connection message comprises:
- an access identifier of the first network device.
36. The method in accordance with claim 34, wherein the SPVC connection message further comprises at least one of:
- connection traffic parameters;
- packet discard information; and
- usage parameter control information.

37. The method in accordance with claim 31, wherein the access identifier comprises:
a network service access point (NSAP) address of the source network device.
38. The method in accordance with claim 31, wherein the access identifier comprises:
an alias for a closed user group (CUG).
39. The method in accordance with claim 30, further comprising:
receiving, at the first network device, a request to create an SPVC connection
from the source end to the destination end;
configuring a first permanent virtual circuit (PVC) connection leg between the
first network device and the source end; and
generating the SPVC connection message comprising an SPVC setup request.
40. The method in accordance with claim 38, wherein said accepting the SPVC
connection comprises:
configuring a second PVC connection leg between the second network device and
the destination end.
41. The method in accordance with claim 39, wherein said configuring the second
PVC connection leg comprises:
selecting an interface on the second network device;
configuring the second PVC connection leg on the selected interface; and
associating the second PVC connection leg with the access identifier.

42. The method in accordance with claim 39, wherein said accepting the SPVC connection further comprises:

transmitting a connect message from the second network device to the first network device.

43. The method in accordance with claim 39, further comprising:

creating a double-ended SPVC connection comprising the first PVC connection leg, the second PVC connection leg, and a switched virtual circuit (SVC) connection leg between the first network device and the second network device via the communications network.

44. The method in accordance with claim 38, wherein said rejecting the SPVC connection comprises:

transmitting a release message from the second network device to the first network device.

45. The method in accordance with claim 30, wherein the SPVC connection message comprises:

a setup request to create a new SPVC connection.

46. The method in accordance with claim 30, wherein the SPVC connection message comprises:

a switched virtual circuit (SVC) connection request to create a new SVC connection.

47. The method in accordance with claim 30, wherein the SPVC connection message comprises:

an SVC release request to release an existing SVC connection.

48. The method in accordance with claim 30, wherein the SPVC connection message comprises:

a connection category change request to change a connection service category for an existing SPVC connection.

49. The method in accordance with claim 30, wherein the SPVC comprises:

a soft permanent virtual path (SPVP) comprising a logical group of virtual circuits.

50. The method in accordance with claim 30, wherein the communications network comprises:

an Asynchronous Transfer Mode (ATM) network.

51. The method in accordance with claim 30, wherein the communications network comprises:

a Frame Relay (FR) network.

52. The method in accordance with claim 30, wherein the source end comprises:
an edge router.
53. The method in accordance with claim 30, wherein the source end comprises:
a digital subscriber line (DSL) access concentrator.
54. The method in accordance with claim 30, wherein the destination end comprises:
an edge router.
55. The method in accordance with claim 30, wherein the destination end comprises:
a digital subscriber line (DSL) access concentrator.
56. The method in accordance with claim 30, further comprising:
receiving, at the first network device, a request to change a connection service
category for an existing SPVC connection, the existing SPVC connection comprising:
a first PVC connection leg between the source end and the first
network device;
a switched virtual circuit (SVC) connection leg between the first
network device and the second network device via the communications
network; and
a second PVC connection leg between the second network device
and the destination end;

reserving resources of the first network device for a new connection service category;

generating the SPVC connection message comprising an SVC release request and a connection service category change request for the existing SPVC connection; and

preserving a connection identifier of the first PVC connection leg.

57. The method in accordance with claim 55, wherein said accepting the SPVC connection comprises:

modifying connection parameters and resources at the second network device in accordance with the connection service category change request;

preserving a connection identifier of the second PVC connection leg; and

transmitting a release complete message to the first network device.

58. The method in accordance with claim 56, further comprising:

de-allocating resources from the first PVC connection leg in response to receiving the release complete message;

allocating new resources on the first PVC connection leg, the new resources corresponding to the new connection service category and traffic parameters; and

creating a new SVC connection leg in accordance with the new connection service category and the traffic parameters.

59. A method for controlling a creation of a double-ended soft permanent virtual circuit (SPVC) connection, the SPVC connection coupling from a source end to a destination end via a communications network, said method comprising:

associating at least one source network device for a source end with a destination network device for the destination end, the destination network device being allowed to accept an SPVC connection from a source network device associated therewith;

initiating, at a source network device, a creation of a double-ended SPVC connection from a source end to the destination end; and

preventing, at the destination network device, an unauthorized SPVC connection creation initiated by a source network device that is not associated with the destination network device.

60. The method in accordance with claim 58, wherein said associating comprises:

creating an access list comprising an access identifier of at least one source network device from which the second network device is allowed to accept an SPVC connection.

61. The method in accordance with claim 58, wherein said initiating comprises:

generating an SPVC connection message and transmitting the SPVC connection message from the source network device to the destination network device.

62. The method in accordance with claim 60, wherein the SPVC connection message comprises:

an access identifier of the network device.

63. The method in accordance with claim 60, further comprising:

transmitting a connect message from the destination network device to the source network device, if the double-ended SPVC connection is accepted; and

transmitting a release message from the destination network device to the source network device, if the double-ended SPVC connection is rejected.

64. The method in accordance with claim 62, further comprising:

creating the double-ended SPVC connection in response to receiving the connect message at the source network device, the double-ended SPVC connection comprising:

a first PVC connection leg coupling from the source end to the source network device;

a second PVC connection leg coupling from the destination network device to the destination end; and

a switched virtual circuit (SVC) connection leg coupling between the source network device and the destination network device via the communications network.

65. A system for controlling a double-ended soft permanent virtual circuit (SPVC) connection, the SPVC connection coupling from a source end to a destination end via a communications network, said system comprising:

means for associating at least one source network device for a source end with a destination network device for a destination end, the destination network device being allowed to accept an SPVC connection from a source network device associated therewith;

a source network device adapted to initiate a creation of a double-ended SPVC connection coupling from a source end to the destination end; and

a destination network device adapted to prevent an unauthorized SPVC connection creation initiated by a source network device that is not associated with the destination network device.

66. The system in accordance with claim 64, wherein said means for associating comprises:

means for creating an access list comprising an access identifier of at least one source network device from which the destination network device is allowed to accept an SPVC connection.

67. The system in accordance with claim 64, wherein said source network device is further adapted to generate an SPVC connection message and transmit the SPVC connection message to said destination network device.

68. The system in accordance with claim 66, wherein the SPVC connection message comprises:

an access identifier of the first network device.

69. The system in accordance with claim 66, wherein said destination network device is further adapted to:

transmit a connect message to the source network device if the double-ended SPVC connection is accepted; and

transmit a release message the source network device if the double-ended SPVC connection is rejected.

70. An apparatus for controlling a double-ended soft permanent virtual circuit (SPVC) connection from a source end to a destination end via a communications network, said apparatus comprising:

means for receiving an SPVC connection message from a first network device for the source end;

means for accepting an SPVC connection in accordance with the SPVC connection message if a second network device receiving the SPVC connection has an association with the first network device; and

means for rejecting the SPVC connection if the second network device does not have an association with the first network device.

71. The apparatus in accordance with claim 69, further comprising:
- means for associating the second network device with an access identifier of a network device from which the second network device is allowed to accept an SPVC connection.
72. The apparatus in accordance with claim 70, wherein said means for associating comprises:
- an access list comprising at least one access identifier.
73. The apparatus in accordance with claim 70, further comprising:
- means for determining if an access identifier of the first network device matches the access identifier associated with the second network device in response to receiving the SPVC connection message.
74. The apparatus in accordance with claim 70, wherein the SPVC connection message comprises:
- an access identifier of the first network device.
75. The apparatus in accordance with claim 73, wherein the SPVC connection message further comprises at least one of:
- connection traffic parameters;
- packet discard information; and
- usage parameter control information.

76. The apparatus in accordance with claim 70, wherein the access identifier comprises:

a network service access point (NSAP) address of the source network device.

77. The apparatus in accordance with claim 70, wherein the access identifier comprises:

an alias for a closed user group (CUG).

78. The apparatus in accordance with claim 69, further comprising:

means for receiving, at the first network device, a request to create an SPVC connection from the source end to the destination end;

means for configuring a first permanent virtual circuit (PVC) connection leg between the first network device and the source end; and

means for generating the SPVC connection message comprising an SPVC setup request.

79. The apparatus in accordance with claim 77, further comprising:

means for configuring a second PVC connection leg between the second network device and the destination end.

80. The apparatus in accordance with claim 78, wherein said means for configuring the second PVC connection leg comprises:

means for selecting an interface on the second network device;

means for configuring the second PVC connection leg on the selected interface;

and

means for associating the second PVC connection leg with the access identifier.

81. The apparatus in accordance with claim 78, further comprising:

means for transmitting a connect message from the second network device to the first network device.

82. The apparatus in accordance with claim 78, further comprising:

means for cross-connecting the first PVC connection leg with a switched virtual circuit (SVC) connection leg on the first network device; and

means for cross-connecting the second PVC connection leg with an SVC connection leg on the second network device.

83. The apparatus in accordance with claim 77, further comprising:

means for transmitting a release message from the second network device to the first network device if the SPVC connection is rejected.

84. The apparatus in accordance with claim 69, wherein the SPVC connection message comprises:

a setup request to create a new SPVC connection;

a switched virtual circuit (SVC) connection request to create a new SVC connection;

an SVC release request to release an existing SVC connection; and

a connection category change request to change a connection service category for an existing SPVC connection.

85. The apparatus in accordance with claim 69, wherein the SPVC comprises:

a soft permanent virtual path (SPVP) comprising a logical group of virtual circuits.

86. The apparatus in accordance with claim 69, wherein the communications network comprises:

an Asynchronous Transfer Mode (ATM) network.

87. The apparatus in accordance with claim 69, wherein the communications network comprises:

a Frame Relay (FR) network.

88. The apparatus in accordance with claim 69, wherein the source end comprises:

an edge router.

89. The apparatus in accordance with claim 69, wherein the source end comprises:

a digital subscriber line (DSL) access concentrator.

90. The apparatus in accordance with claim 69, wherein the destination end comprises:

an edge router.

91. The apparatus in accordance with claim 69, wherein the destination end comprises:

a digital subscriber line (DSL) access concentrator.

92. The apparatus in accordance with claim 69, further comprising:

means for receiving, at the first network device, a request to change a connection service category for an existing SPVC connection, the existing SPVC connection comprising:

a first PVC connection leg between the source end and the first network device;

a switched virtual circuit (SVC) connection leg between the first network device and the second network device via the communications network; and

a second PVC connection leg between the second network device and the destination end;

means for reserving resources of the first network device for a new connection service category;

means for generating the SPVC connection message comprising an SVC release request and a connection service category change request for the existing SPVC connection; and

means for preserving a connection identifier of the first PVC connection leg.

93. The apparatus in accordance with claim 91, further comprising:

means for modifying connection parameters and resources at the second network device in accordance with the connection service category change request;

means for preserving a connection identifier of the second PVC connection leg;

and

means for transmitting a release complete message to the first network device.

94. The apparatus in accordance with claim 92, further comprising:

means for de-allocating resources from the first PVC connection leg in response to receiving the release complete message;

means for allocating new resources on the first PVC connection leg, the new resources corresponding to the new connection service category and traffic parameters; and

means for creating a new SVC connection leg in accordance with the new connection service category and the traffic parameters.

95. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for controlling a double-

ended soft permanent virtual circuit (SPVC) connection from a source end to a destination end via a communications network, the method comprising:

- receiving an SPVC connection message from a first network device for the source end;

- accepting an SPVC connection in accordance with the SPVC connection message if a second network device receiving the SPVC connection has an association with the first network device; and

- rejecting the SPVC connection if the second network device does not have an association with the first network device.

96. The program storage device in accordance with claim 94, wherein said method further comprising:

- associating the second network device with an access identifier of a network device from which the second network device is allowed to accept an SPVC connection.

97. The program storage device in accordance with claim 95, wherein said associating comprises:

- creating an access list comprising at least one access identifier.

98. The program storage device in accordance with claim 95, wherein said method further comprises:

determining if an access identifier of the first network device matches the access identifier associated with the second network device in response to receiving the SPVC connection message.

99. The program storage device in accordance with claim 95, wherein the SPVC connection message comprises:

an access identifier of the first network device.

100. The program storage device in accordance with claim 98, wherein the SPVC connection message further comprises at least one of:

connection traffic parameters;

packet discard information; and

usage parameter control information.

101. The program storage device in accordance with claim 95, wherein the access identifier comprises:

a network service access point (NSAP) address of the source network device.

102. The program storage device in accordance with claim 95, wherein the access identifier comprises:

an alias for a closed user group (CUG).

103. The program storage device in accordance with claim 94, wherein said method further comprises:

receiving, at the first network device, a request to create an SPVC connection from the source end to the destination end;

configuring a first permanent virtual circuit (PVC) connection leg between the first network device and the source end; and

generating the SPVC connection message comprising an SPVC setup request.

104. The program storage device in accordance with claim 102, wherein said accepting the SPVC connection comprises:

configuring a second PVC connection leg between the second network device and the destination end.

105. The program storage device in accordance with claim 103, wherein said configuring the second PVC connection leg comprises:

selecting an interface on the second network device;

configuring the second PVC connection leg on the selected interface; and

associating the second PVC connection leg with the access identifier.

106. The program storage device in accordance with claim 103, wherein said accepting the SPVC connection further comprises:

transmitting a connect message from the second network device to the first network device.

107. The program storage device in accordance with claim 103, wherein said method further comprises:

creating a double-ended SPVC connection comprising the first PVC connection leg, the second PVC connection leg, and a switched virtual circuit (SVC) connection leg between the first network device and the second network device via the communications network.

108. The program storage device in accordance with claim 102, wherein said rejecting the SPVC connection comprises:

transmitting a release message from the second network device to the first network device.

109. The program storage device in accordance with claim 94, wherein the SPVC connection message comprises:

a setup request to create a new SPVC connection.

110. The program storage device in accordance with claim 94, wherein the SPVC connection message comprises:

a switched virtual circuit (SVC) connection request to create a new SVC connection.

111. The program storage device in accordance with claim 94, wherein the SPVC connection message comprises:

an SVC release request to release an existing SVC connection.

112. The program storage device in accordance with claim 94, wherein the SPVC connection message comprises:

a connection category change request to change a connection service category for an existing SPVC connection.

113. The program storage device in accordance with claim 94, wherein the SPVC comprises:

a soft permanent virtual path (SPVP) comprising a logical group of virtual circuits.

114. The program storage device in accordance with claim 94, wherein the communications network comprises:

an Asynchronous Transfer Mode (ATM) network.

115. The program storage device in accordance with claim 94, wherein the communications network comprises:

a Frame Relay (FR) network.

116. The program storage device in accordance with claim 94, wherein the source end comprises:

an edge router.

117. The program storage device in accordance with claim 94, wherein the source end comprises:

a digital subscriber line (DSL) access concentrator.

118. The program storage device in accordance with claim 94, wherein the destination end comprises:

an edge router.

119. The program storage device in accordance with claim 94, wherein the destination end comprises:

a digital subscriber line (DSL) access concentrator.

120. The program storage device in accordance with claim 94, wherein said method further comprises:

receiving, at the first network device, a request to change a connection service category for an existing SPVC connection, the existing SPVC connection comprising:

a first PVC connection leg between the source end and the first network device;

a switched virtual circuit (SVC) connection leg between the first network device and the second network device via the communications network; and

a second PVC connection leg between the second network device and the destination end;

reserving resources of the first network device for a new connection service category;

generating the SPVC connection message comprising an SVC release request and a connection service category change request for the existing SPVC connection; and
preserving a connection identifier of the first PVC connection leg.

121. The program storage device in accordance with claim 119, wherein said accepting the SPVC connection comprises:

modifying connection parameters and resources at the second network device in accordance with the connection service category change request;

preserving a connection identifier of the second PVC connection leg; and
transmitting a release complete message to the first network device.

122. The program storage device in accordance with claim 120, wherein said method further comprises:

de-allocating resources from the first PVC connection leg in response to receiving the release complete message;

allocating new resources on the first PVC connection leg, the new resources corresponding to the new connection service category and traffic parameters; and creating a new SVC connection leg in accordance with the new connection service category and the traffic parameters.